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EDITORIAL COMMENT

Revascularization of a Chronically Occluded Left Anterior Descending Artery

Is it Worth All the Effort?*

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Revascularization of a chronically occluded coronary artery (CTO) has been the focus of investigation from several different aspects. Initial studies have reported technical tips and tricks, features predicting procedural success, and complications in an effort to decrease the considerably high failure rates. With evolution in technique, equipment, and expertise, further studies have been conducted on clinical outcomes and indications, including the complex area of myocardial viability after an earlier myocardial infarction in the distribution in the area of the occluded coronary artery.

Certain centers, such as the one of the authors of the paper by Safley et al. (1) in this issue of *JACC: Cardiovascular Inteventions*, have been practicing CTO procedures in a high-volume center for many years. Indeed, it may be self-explanatory to many physicians that opening an occluded coronary artery is supposed to be better than leaving it closed.

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The landscape has grown to be more demanding than anticipated in this field. Generalization of CTO procedures is currently dependent not only on technical expertise but also on establishment of indications widely accepted by the emerging centers and new operators. However, strategy trials have been very difficult to perform in the ideal, unselected patient population. In other words, randomized comparisons of intervention versus medical therapy for CTO are likely to be conducted mostly in those patients who are poor candidates for intervention (little viability, limited or no symptoms, small vessel distribution, diffuse disease, nonoperative candidate, and so on), while the good candidates are treated with intervention outside the trial. This is similar to randomizing only patients who are poor candidates for both intervention and surgery for multivessel disease comparison, while each type of therapy is selected outside the trial for those who are good candidates! This is the reality of clinical trials under the pressure of a heavy regulatory and clinical bias environment.

The investigation by Safley et al. (1) is based on a large database of "all comers" CTO procedures with long-term follow-up at a single center with high operator expertise representing their entire experience over the years. The latter advantage is also one of its limitations: the procedures were conducted long ago with a striking <20% rate of stent use highlighting the technical differences to today's approach. We suspect that very few CTO vessels escaped revascularization attempt by Safley et al. over the many years of their practice. Although those were not captured in the database, they would likely be an improper medical therapy arm since they would have very unfavorable angiographic and clinical features responsible for their nonselection. Another group, also not represented in the study of Safley et al. (1) and potentially closer in characteristics, is the patients referred for bypass surgery mainly due to a CTO in one of the diseased vessels.

The methodology of assessing potential CTO revascularization benefits by comparing the outcomes after successful versus unsuccessful procedures is interesting. If the vessel is closed to begin with, the procedure should not make it any worse. However, the in-hospital complication rates were higher after unsuccessful CTO procedure, especially in the left anterior descending coronary artery (LAD) territory. This implies performance of CTO intervention in high-risk group, perhaps even early after myocardial infarction (yet beyond 7 days as clarified in the study).

The long-term results are in line with other observations on the importance of the anterior wall for the overall left ventricular performance with implications for patient outcome (2–4). Successful CTO procedure in the LAD was associated with improved survival at 5 years. The question is, how were the CTO failures treated subsequently, with medical therapy alone or with bypass surgery? We suspect that medical therapy is the presumption, and this, indeed, seems inadequate based on the results reported. The lesson to be learned from Safley et al. (1) is that a CTO in the LAD needs to have a successful revascularization (especially in those with evidence of ischemia), and the presumption is that surgery would be recommended if an interventional approach were unsuccessful.

Is there a clear message regarding medical therapy from this study? Formally not, but indirectly, yes. When the potential for improved survival is discussed, many physicians

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would feel compelled to recommend revascularization of the CTO in the LAD territory and insist on an ultimately successful strategy.

Revascularization of non-LAD CTOs remains unaffected by this investigation. Indications appear to be significant angina and ischemia, but we do not think survival would be jeopardized with an unsuccessful attempt. This clinical impression is not altered by the report of Safley et al. (1)

We only wished that Safley et al. (1) could have conducted their CTO procedures under a randomized protocol so that their results would provide a model to follow, but the previously mentioned limitations on performing such trials make this difficult. Great performance on a registry-based methodology does not support major conclusions on selecting a therapeutic strategy in the present day and age. Although difficult, performance of randomized trials with enthusiastic participation of the large patient volume centers and operators is necessary for definitive conclusions (5).

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